

Serial No. 09/975,682 (Atty. Docket No. Huang 12)
Amendment dated June 30, 2005
Reply of Office Action of March 30, 2005

AMENDMENT TO THE CLAIMS

Please consider the claims as follows:

1. (Currently Amended) Method for reducing cross-talk in a communications system comprising a plurality of transmitters for transmitting encoded data signals via respective communications channels, said method comprising the steps of:

processing a first encoded data signal according to at least one pre-coding matrix to produce a first pre-coded signal, each of said at least one pre-coding ~~matrices~~ matrix having associated with it a respective encoded data signal;

communicating said first pre-coded signal to a respective first communication channel; and

adapting said at least one pre-coding ~~matrices~~ matrix in response to an impairment indicative signal;

said processing tending to offset channel impairments within said first communications channel.

2. (Currently Amended) The method of claim 1, further comprising the steps of:

receiving said first pre-coded signal from said first communications channel; and

generating said impairment indicative signal in response to a determination of a channel impairment level of said first communications channel.

3. (Original) The method of claim 2, wherein said impairment indicative signal is determined according to a least mean square (LMS) algorithm.

4. (Currently Amended) The method of claim 1, wherein signals propagated via each of said communications channels comprise a respective set of in-phase (I) and quadrature (Q) signals forming carrierless amplitude and phase (CAP) modulated signals.

5. (Currently Amended) The method of claim 1, wherein signals propagated via each of said communications channels comprise a respective set of in-phase (I) and quadrature (Q) signals forming quadrature amplitude modulated (QAM) signals.

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6. (Currently Amended) The method of claim 1, further comprising the step of:
prior to processing said first encoded data signal, selecting, as initial parameters
of said at least one pre-coding matrix, a set of parameters tending to offset said channel
impairment impairments of said first communications channel, said step of selecting
initial parameters comprising the steps of:

~~determining initial parameters of said at least one pre-coding matrix prior~~
~~to processing said first encoded data signal, said initial parameters of said at~~
~~least one pre-coding matrix determined according to the steps of:~~

propagating a pre-defined training sequence via said first communications
channel;

receiving said pre-defined training sequence from said first
communications channel; and

determining initial parameters of said at least one pre-coding matrix, using
said received pre-defined training sequence, related to a channel impairment
impairments of said first communications channel.

7. (Currently Amended) The method of claim 4, wherein said step of adapting
comprises the steps of:

increasing an amplitude level of said at least one respective set of said I and Q
signals; and

repeating said steps of processing and communicating until said an impairment
indicative signal level is less than a threshold level.

8. (Original) The method of claim 1, wherein said communications system comprises N
transmitters, where N is an integer, each of said N transmitters performing said steps of
processing, communicating and adapting using respective encoded data signals.

9. (Original) The method of claim 8, wherein each of said N transmitters processes an
encoded data signal according to N-1 pre-coding matrices, each of said N-1 pre-coding

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matrices being associated with a respective encoded data signal from the other transmitters.

10. (Original) The method of claim 8, wherein each of said N transmitters processes an encoded data signal according to N pre-coding matrices, each of said N pre-coding matrices being associated with a respective encoded data signal from each of the N transmitters.

11. (Currently Amended) The method of claim 8, wherein:

each of said N transmitters performs the step of selecting initial parameters for respective at least one pre-coding matrices prior to processing a respective encoded data signal, said selected initial tending to offset channel impairment impairments of said respective communications channels, said step of selecting initial parameters comprising the steps of:

~~determining initial parameters of said at least one pre-coding matrix prior to processing a respective encoded data signal, said initial parameters of said at least one pre-coding matrix determined according to the steps of:~~

propagating a pre-defined training sequence via a respective communications channel;

receiving said pre-defined training sequence from said respective communications channel; and

determining initial parameters of said at least one pre-coding matrix, using said received pre-defined training sequence, a said channel impairment impairments of said respective communications channel.

12. (Original) The method of claim 6, further comprising the step of training an equalizer to reduce channel-specific impairments from said received pre-defined training sequence prior to selecting said initial matrix parameters.

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13. (Original) The method of claim 11, further comprising the step of training an equalizer to reduce channel-specific impairments from said received pre-defined training sequence prior to selecting said initial matrix parameters.

14. (Currently Amended) Method for reducing cross-talk in a communications system comprising a plurality of communications channels, each communications channel propagating a respective set of in-phase (I) and quadrature (Q) signals, said method comprising the steps of:

- (a) processing at least one set of I and Q signals according to a respective pre-coding matrix to produce respective pre-coded I and Q signals;
- (b) communicating said at least one set of pre-coded I and Q signals via a respective communication channel;
- (c) receiving, for each communicated set of pre-coded I and Q signals, difference error data indicative of differences between transmitted and transmission errors in received signals;
- (d) adapting respective pre-coding matrices in response to respective received difference data; and
- (e) repeating steps (a) through (d) until said difference error data associated with said at least one set of I and Q signals is less than a threshold difference level.

15. (Currently Amended) The method of claim 14, wherein said error data indicative of differences between transmitted and received signals comprises mean square error data.

16. (Currently Amended) The method of claim 14, wherein said at least one set of in-phase (I) and quadrature (Q) signals form carrierless amplitude and phase (CAP) modulated signals.

17. (Currently Amended) The method of claim 14, wherein said at least one set of in-phase (I) and quadrature (Q) signals form quadrature amplitude modulated (QAM) signals.

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18. (Currently Amended) The method of claim 14, further comprising the steps of:

- (f) increasing an amplitude level of said at least one set of said I and Q signals; and
- (g) repeating steps (a) through (d) until said difference error data associated with said at least one set of I and Q signals is less than a second threshold difference level.

19. (Cancelled) Apparatus, comprising:

a transmitter, for adapting an encoded data signal according to at least one pre-coded signal, said at least one pre-coded signal being determined with respect to encoded signals from at least one other transmitter, said pre-coder function adapting said encoded signal in response to a pre-coded matrix to produce a pre-coded encoded signal.

20. (Cancelled) The apparatus of claim 19, wherein said transmitter further comprises a filtering function, for adapting said pre-coded encoded signal to a transmission channel, said transmission channel tending to impair signals transmitted therethrough.

21. (Cancelled) The apparatus of claim 20, further comprising:

a plurality of receivers, for receiving respective transmitted signals from respective transmission channels, each of said receivers determining an impairment level associated with a corresponding transmission channel and propagating impairment indicative data to a corresponding transmitter;

said transmitters adapting respective pre-coder matrices in response to respective channel impairment indicative signals.

22. (Cancelled) Apparatus for reducing cross-talk in a communications system comprising a plurality of transmitters for transmitting encoded data signals via respective communications channels, said apparatus comprising:

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a transmitter including a summer for adding a first encoded data signal to at least one pre-coded data signal to produce an output signal, said at least one pre-coded data signal determined according to a respective pre-coding matrix, each of said at least one pre-coding matrices having associated with it a respective encoded data signal;

said transmitter communicating said first pre-coded signal to a respective first communication channel; and

said transmitter modifying said at least one pre-coding matrices in response to an impairment indicative signal in a manner tending to offset channel impairments experienced by said output signal within said first communications channel.

23. (Currently Amended) Apparatus for reducing cross-talk in a communications system comprising a plurality of transmitters for transmitting encoded data signals via respective communications channels, said apparatus comprising:

means for processing a first encoded data signal according to at least one pre-coding matrix to produce a first pre-coded signal, each of said at least one pre-coding ~~matrices~~ matrix having associated with it a respective encoded data signal;

means for communicating said first pre-coded signal to a respective first communication channel; and

means for adapting said at least one pre-coding ~~matrices~~ matrix in response to an impairment indicative signal;

said processing tending to offset channel impairments within said first communications channel.